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THE FORESTS OF LUZERNE COUNTY, PENNSYLVANIA IN RELATION TO EMPLOYMENT AND WELFARE

By

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Anthracite Forest Region is a convenient name for 15 counties, shown on the map on the back of this publication, which contain or surround the hard-coal deposits of Pennsylvania. The forests of this region are now badly depleted. But preliminary estimates indicate that under good management they might, in time, furnish most of the forest products and services the region requires.

The forest survey of this region aims to determine:

(1) what measures, and how much labor, are needed to rebuild the forests;

(2) how much labor might be employed in permanent industries based on the restored forest.

Full answers to these questions will be of utmost value both now and in the period of readjustment following the war.

Note: The facts presented in the following pages were obtained during 1940 and 1941. The Work Projects Administration, OP 165-2-23-834 and -1605, gave indispensable aid in the field and office.

THE SURVEY -- ORIGIN AND METHOD

Aroused by acute unemployment growing out of the chronic depression that has gripped the anthracite industry since the mid-twenties, local citizens of the region, backed by the Wyoming Valley Chamber of Commerce, appealed through their representatives in Congress for federal aid in appraising their non-coal resources. Specifically, they asked, "Can unemployed workers be assigned immediately to rehabilitating the forest resource, and if so, what present and long-time economic benefits will result?"

Anthracite Forest Region is a convenient name for 15 counties, shown on the back cover of this publication. These contain or surround the hard-coal deposits of Pennsylvania. The forests, now depleted, contribute little to local employment or welfare. Restored and properly managed, they might contribute much.

Survey Papers No. 2 and 3 describe some of the things which should be done regionally to restore forest land. The present paper outlines in broad terms for one county -- Luzerne -- steps designed to restore the productivity of her forests, and appraises the employment and other benefits to be expected. A more detailed appraisal must await the completion of the Survey throughout the region.

A "timber cruise", or forest inventory, gridironed the county with survey lines three miles apart. The lines crossed the main ridges and streams at right angles. Three-man crews recorded forest conditions or other land use at every 1/10 of a mile along more than 300 miles of cruise line. In timberland, the species and size of all trees, recent diameter growth of selected trees, and information on age of the timber and on soil productivity were recorded. In open areas, note was made of the land use such as "cropland," "urban," or "mine refuse bank." Throughout the cruise the fullest possible use was made of air photographs. Careful checks of field work kept the survey reasonably accurate. These data were then used as a statistical sample to prepare county-wide area estimates. Specially prepared tables were used to estimate volume in terms of board feet, cubic feet, and tons of mine props. Draftsmen compiled from air photos and other sources a land-use map of the county showing the location of all forested tracts larger than 6 acres, as well as open farmland, mine waste, and municipal areas.

Local sawmill operators, mine-timber operators, and the occasional remanufacturer of wood, were interviewed on the amount and kind of timber cut in the county in 1940. The use of fuelwood and fence posts was ascertained from 10 percent of all farmers. The annual requirements of the coal companies for props, ties, and lumber was determined from purchasing agents and prop yards. Forest ownership, taxation, and tax-delinquency data were obtained from county records.

THE FORESTS OF LUZERNE COUNTY, PENNSYLVANIA

IN RELATION TO EMPLOYMENT AND WELFARE

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FINDINGS IN BRIEF

Luzerne County needs everything restored forests could give her: More wood, additional jobs, increased income, improved recreational facilities, better watersheds.

More than three-fifths of Luzerne County, some 365,000 acres, is forest land; almost 60,000 acres of this is unproductive and more than 90 percent of the productive forest supports immature timber; only 9 percent supports merchantable saw timber.

Luzerne County's forest soils can produce fine timber. Properly managed, the annual yield of forest products could be increased from 6 to 45 million board feet of saw timber and from 122 to 360 thousand tons of round timbers. Income to forest owners could be increased from about $120,000 yearly to perhaps $675,000; the value of forest products could be raised from $615,000 to about $7,500,000 annually; and the number of yearlong jobs could be increased from 276 to more than 3,000. At the same time, the county tax base could be widened; greater opportunities for outdoor recreation would be provided; protection to watersheds against erosion, and to valleys and mines against flooding, would be intensified.

To accomplish this, forest growing stock must be built up to more than four times its present status by shifting present cut of saw timber material for mine timbers to smaller and lower quality trees; protection of all lands against fires, insects, and disease must be improved; planting is necessary in large areas.

Local action supported by cooperation from State and Federal agencies can reach this goal: Forest landowners can control cutting; sawmill and timber operators can cooperate; the county can create county forests from tax delinquent lands; the townships and municipalities can strengthen fire protection; civic organizations can promote permanent wood-using industries; the citizens and taxpayers can help mould public opinion towards support of a forest restoration program.

THE FORESTS OF LUZERNE COUNTY, PENNSYLVANIA IN RELATION TO EMPLOYMENT AND WELFARE

By R. D. Forbes and Clement Mesavage 1/

LUZERNE COUNTY NEEDS GOOD FORESTS

Luzerne County, Pennsylvania, is blessed with some of the world's finest deposits of hard coal. For more than 50 years this magnificent resource has dwarfed almost to insignificance all of the County's other natural resources. Luzerne's fortunes rose steadily for decades while anthracite was king of fuels. Then came vigorous competition and King Anthracite had to share his throne with soft coal, gas, and oil. In a brief 15 years anthracite production dropped one-half below its peak. The anthracite counties began to suffer grievously from unemployment, dwindling taxes, and general impoverishment.

Coal-bred and coal-minded communities stuck grimly to their hope that coal markets could be recovered, that the "good old days" would return. But abandonment of collieries continued, general conditions changed only for the worse, and as late as April, 1942, the Federal Anthracite Commission reported, in chilly phrase, "a continuing unsatisfactory economic condition in the area despite the impetus given to business generally by war production. ----Total employment has increased little since the depths of the depression years."

Against the background of the Commission's report, the situation grows clearer. Prosperity based on coal as a fuel alone cannot be expected to return to the anthracite region. In planning for economic recovery, says the Commission, "establishment of industries which are adapted to the long-term needs of the area should be the primary objective." They recommended specifically a thorough appraisal of the forest resource with a view toward adopting a vigorous program for its restoration. Wrecked or neglected as these forests now are, within a few years they might become the basis for wood-using industries capable of supporting directly or indirectly a population equal to that of Hazleton.

Luzerne County needs the jobs her forests might give her. She also needs wood. A single visit to a mine colliery will reveal the importance of forest products to the mining industry. Below ground, wooden props and lagging support the roof of endless galleries, and protect the miner against falling stone and coal. Wooden brattices regulate his vital air supply, and wooden "boxes" confine the coal he shoots down in vertical veins. Wooden rails provide a temporary track from the face of his chamber to the steel rail. Crossties support the rail

1/ R. D. Forbes, formerly Senior Forester and Clement Mesavage, formerly Assistant Forester, Allegheny Forest Experiment Station. The following men participated in the Survey and contributed valuable suggestions for this report: Clifford W. Beck, Edward W. Carter, Stanley M. Filip, Earl J. Rogers and Arthur S. Todd, Jr.

on which the loaded coal cars are hauled out of the mine and many of the cars are of wood. Without the lowly sprag the movement of cars in the mine would be a hazardous business indeed. These double-pointed billets, some three inches thick and about twenty-two inches long, are thrown by "coal runners" into the spokes of a moving car to retard or stop it.

Above ground, crossties support the rails for both mine cars and standard railroad cars; many breakers are constructed of wood, and all use indispensable hickory "springboards," to suspend the shaker screen that separates coal according to size. Considerable lumber is used in flumes to divert surface waters from running into the mine. Wood is of course used for much general construction.

Not only the mines, but the railroads, the farms, and the 440,000 people of Luzerne County need wood in many forms. Table 1 shows some of their requirements in 1940, but includes none of the boxes and crates, the furniture, the caskets, the paper, and countless other necessities manufactured from wood which were largely imported into the County in that year.

Table 1 - ESTIMATED REQUIREMENTS FOR WOOD
LUZERNE COUNTY, 1940

Product	M board feet	M cubic feet 1/
Round mine timbers	23,544	9,610
Sawed products, for mines	28,560	5,772
Sawed products, for railroads	2,750	550
Lumber for miscellaneous industries and general construction	4,400	880
Fuelwood and fence posts		310
Total	59,254	17,122

1/ Includes board feet in previous column; volume including bark.

Luzerne County also urgently needs certain services which forests can best supply: Health-giving outdoor recreation for large urban populations, both local and regional, protection of watersheds against erosion and floods, and protection of mines against rapid inflow of surface water. Areas in which to hunt and fish and hike and picnic are close at hand. Most of the people here obtain their domestic water from forested watersheds. Conversely, most of the damaging flash floods and heavy seepage into the mines is due to rapid surface run-off from deforested watersheds.

LAND USE IN LUZERNE COUNTY, PENNSYLVANIA

Compiled on U.S. Geological Survey base from A. A. A. aerial photographs and Pennsylvania Highway Department maps

ALLEGHENY FOREST EXPERIMENT STATION

ECONOMIC SURVEY

ANTHRACITE FOREST REGION

Note: Assistance in the preparation of this map was furnished by the personnel of Work Projects Administration official project 165-8-23-634

Compilation and tracing by Roger Palmer
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PRODUCTIVE SOILS SUPPORT DEPLETED FORESTS

Heavily wooded mountains and valleys once dominated Luzerne's landscape. It was no doubt the towering hardwoods of the Wyoming Valley and of the less extensive valleys beyond the ridges to the west and south which impressed the pre-Revolutionary pioneers from far-off Connecticut and nearer Philadelphia with the agricultural possibilities of what was in time to become Luzerne County, Pennsylvania. The wrangling and occasional bloodshed of the "Pennamite Wars" were over these fertile valleys. Here, the forest was early cleared to make way for the plow. But the tide of agricultural clearing turned before the present century, and considerable abandoned farm land has reverted to forest. Clearing for highways, and for municipal, mining, and occasional suburban or farm use is unlikely henceforth to reduce the total area devoted to forests. Present land use in Luzerne County is indicated in table 2 and in figure 1.

Table 2 - LAND USE IN LUZERNE COUNTY, 1940

	Acres	Percent
Forest (includes farm woodlands)	365,200	63.3
Farmland (excludes farm woodlands)		
Cropland	100,700	
Pasture	23,000	
Abandoned	12,800	
Sub-total	136,500	23.7
Surface mining use	16,200	2.8
Urban, roads, and similar uses	48,700	8.4
Lakes, streams, marshes	10,700	1.8
Total	577,300	100.0

The deep valley soils were not the only soils producing magnificent forests. The thinner soils were hardly less hospitable to pines, hemlock, and spruce. Heavy stands of hardwoods or softwoods, or mixtures of them, awaited human use all over the county. Early in the history of Wilkes-Barre the abundance of both hardwoods and pine nourished the hope that the city would become a shipbuilding center at which ships could be built "in safety" and floated on the spring floods down the Susquehanna River to salt water! Logs at least were thus transported in great quantities. The ruggedness of the local mountains did not long remain a serious obstacle to logging, and by 1900 cutting for one purpose or another had extended up the remotest ravines and to the farthest mountaintops of the county.

Remnants of the original timber will probably never be cut. These splendid stands, part of 6,700 acres of forest land dedicated to recreation, are the best proof that can be offered of the potential importance to the county of its forest resource. The best-known stand is in Ricketts' Glen, near the head of Kitchen Creek in the northwestern part of the county. Its beautiful hemlock and hardwoods have been reserfed from cutting. The land is now under lease by a sportsmen's club which permits recreational use by the public under fee. In 1940 the State appropriated $150,000 for its purchase as a State Park, but negotiations have not been completed. A virgin white pine stand preserved against cutting is located in a real estate development known as Bear Creek Village, on the edge of the Pocono Plateau.

Forest ownership in Luzerne County is widely dispersed. Although coal and water companies own nearly 30 percent of all forest land, in tracts averaging over 2,500 acres, some 3,400 private individuals own more than 60 percent with holdings averaging but 67 acres apiece, (table 3).

Table 3 - FOREST AREA BY OWNERSHIP
LUZERNE COUNTY, 1940

	Number	Percent	Acres	Percent
Public owners				
State	1	neg.	17,200	4.7
County	1	neg.	15,000	4.1
Total public	2	0.1	32,200	8.8
Private owners				
Coal and water companies	41	1.2	105,200	28.8
Farmers	1,768	51.3	47,300	13.0
Other owners of				
300 acres and over	75	2.2	57,500	15.7
Less than 300 acres	1,560	45.2	123,000	33.7
Total private	3,444	99.9	333,000	91.2
All owners	3,446	100.0	365,200	100.0

Forest areas now owned by the public are nearly equally divided between the State Game Commission and the County of Luzerne. These public areas at present are growing little timber, and their immediate value lies in their recreational possibilities for hunting and fishing. The State Game Lands are already developed for that purpose. All of the land now in possession of the county has been returned to it through tax delinquency. The 15,000 acres are in scattered tracts, many of which the county is planning to develop as county forest areas.

Almost 60,000 acres of forest land is unproductive. A large proportion of the forest area underlain by coal now supports only poor tree growth, (table 4). This is chiefly because such areas have been heavily over-cut to supply mine timbers. They also house the bulk of the county's dense population (495 persons to the square mile), which creates a very high risk from forest fires. The woodlands here have

been burned repeatedly. Very considerable areas on the Pocono Plateau in the eastern part of the county have also been reduced by fires to scrub oak, gray birch, or low shrubs.

Table 4 - FOREST AREA AND STANDING TIMBER VOLUME, BY FOREST CONDITIONS, LUZERNE COUNTY, 1940

Forest condition and stand per acre classes	Area	Volume of standing timber		
	acres	M cu.ft. 1/	Cords 1/	M bd.ft. 2/
Recreation land	6,700	3/	3/	3/
Unproductive forest land	59,400	4/	4/	4/
Young forest				
Recently cut over	24,200	4/	4/	4/
5 cords or less	164,300	23,955	299,437	17,075
Total	188,500	23,955	299,437	17,075
Merchantable cordwood				
5.1-12.5 cords	63,400	39,839	497,987	35,135
12.6-18.6 "	15,700	19,038	237,975	13,360
18.8-25.0 "	2,300	3,843	48,037	2,390
Over 25.0 "	600	1,252	15,650	710
Total	82,000	63,972	799,651	51,595
Merchantable saw timber				
2000-4000 bd.ft.	15,700	20,590	257,375	44,320
4000-6000 " "	5,500	9,250	115,625	26,590
6000-8000 " "	3,200	7,270	90,875	22,230
Over 8000 " "	4,200	11,990	149,875	45,575
Total	28,600	49,100	613,750	138,715
Total forest	365,200	137,027	1,712,838	207,385

1/ Total volume in cordwood and saw-timber material, including bark.
2/ Based on International 1/4-inch rule, which closely approximates green lumber tally.
3/ Wood volume is unavailable for cutting.
4/ Wood volume is negligible.

More than 90 percent of the productive forest supports immature timber. Recently cut-over lands and young growth supporting less than 5 cords per acre constitute the bulk of Luzerne's forests. Because the trees are small the young growth is producing but 14 board feet per acre per year, (table 5). Not until 1980 and thereafter can this land provide a reasonably satisfactory income to owners, earnings for wood cutters, and timber for industries. Meanwhile, the State must protect it from fire, the county protect it from trespass, and the owner must pay taxes from other income.

Young timber stands of 5 or more cords per acre cover 82,000 acres. Some of these will produce saw timber by 1960, and growth now averages 61 board feet per acre per year. If such stands remain uncut for 11 years, their volume will be doubled. These cordwood stands grow at the most rapid rate of all and deserve careful handling because they furnish the earliest recruits to the saw-timber class.

Table 5 - TOTAL GROWTH, GROWTH PER ACRE, AND GROWTH RATES BY PRODUCTIVE FOREST CONDITIONS, LUZERNE COUNTY, 1940

Forest condition and stand per acre classes	Cubic feet, including bark			Board feet, Int. ¼" log rule		
	Total growth	Growth per acre	Growth rate	Total growth	Growth per acre	Growth rate
	M cu.ft.	cu.ft.	percent	M bd.ft.	bd.ft.	percent
Young forest:						
5 cords or less	2,250	14	9.4	2,310	14	13.5
Merchantable:						
Cordwood						
5.1-12.5 cords	2,890	45	7.2	3,370	53	9.5
12.6-18.7 "	1,070	68	5.6	1,320	84	9.8
18.8-25.0 "	180	78	4.6	240	105	10.0
Over 25.0 "	56	94	4.3	70	117	9.8
	4,196	51	6.6	5,000	61	9.7
Saw timber						
2000-4000 bd.ft.	782	50	3.8	2,180	139	4.9
4000-6000 " "	318	58	3.5	1,190	217	4.5
6000-8000 " "	230	72	3.2	925	289	4.2
Over 8000 " "	380	91	3.2	1,420	338	3.1
	1,710	60	3.5	5,715	200	4.1
Total forest	8,156	22	6.0	13,025	36	6.3

Only 9 percent of productive forest land contains merchantable saw timber. Stands of saw timber dense enough to log profitably cover only 28,600 acres. Occupying less than 8 percent of the forest area, these stands are almost the only source of large mine props and lumber in the county. They also represent the sole immediate hope that new wood-using industries can be established in Luzerne County without importing timber from adjacent counties. More than half of them are young or poorly stocked; that is, the volume per acre is only 2,000 to 4,000 board feet. The average for the entire area is 4,850 board feet. Growth averages 200 board feet per acre per year. This contrasts sharply with growths of 14 and 61 board feet per acre for the young forest and cordwood stands. There is no reason to believe that the soils of saw-timber stands average appreciably better than those of cordwood or young timber. Better stocking and larger size of trees are the chief cause of greater growth. An increase in density and size of cordwood will cause a corresponding increase in board-foot growth.

Tables 6 and 7 show for these merchantable cordwood and saw-timber

Table 6 - CUBIC-FOOT VOLUME IN MERCHANTABLE CORDWOOD AND SAW-TIMBER STANDS BY TREE-DIAMETER CLASSES AND SPECIES
LUZERNE COUNTY, 1940

Tree-diameter class	White Pine	Red Spruce	Hemlock	Pitch Pine	Hickories	Northern Red Oak	Black, Pin and Scarlet Oak	White Oak	Chestnut Oak	Sugar (hard) Maple	Red (soft) Maple	Yellow and River (red) Birch	Beech	Ash, Basswood, Yellow-poplar 1/	Black Cherry	Elm	Gum	Paper Birch	Black Locust	All Species
Inches	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	
6	1,730	70	1,910	573	982	1,069	2,356	3,600	2,831	459	4,126	1,642	597	1,733	555	102	1,613	47	166	
8	2,142	8	1,949	643	712	1,470	2,721	3,338	2,498	436	2,456	1,436	432	1,621	281	99	1,322			
10	2,129	14	2,369	651	479	1,182	2,772	2,510	2,167	274	1,626	913	364	1,369	186	97	878	9	12	
12	2,025	22	2,559	412	271	794	2,411	1,573	1,163	188	798	676	286	836	171	105	253			
14	2,065	31	1,386	172	164	388	2,069	1,024	786	173	408	281	245	470	102		75	27		
16	751		1,161		38	334	759	968	283	192	362	96	110	388	67		65			
18	1,163		907	150	138	152	725	538	153	36	133		48	263	36		146			
20	282		555	47		199	139	398	324		56	113	121	141	46		61			
22	359		78			169	27	652	58	199				92			58			
24	664					107	69	704	83		69									
26			481					81	163	81										
28							94	326	94											
30	182							109												
Over 30			200						181											
All sizes	13,492	145	13,555	2,648	2,784	5,864	14,142	15,821	10,784	2,038	10,034	5,157	2,203	6,913	1,444	403	4,471	83	178	2/ 113,07

1/ Ash comprises roughly half of the combined volumes of ash, basswood, and yellowpoplar.

2/ Total includes negligible volume of little-used species.

Table 7 - BOARD-FOOT VOLUME IN MERCHANTABLE CORDWOOD AND SAW-TIMBER STANDS BY TREE-DIAMETER CLASSES AND SPECIES
LUZERNE COUNTY, 1940

Tree-diameter class	White Pine	Red Spruce	Hemlock	Pitch Pine	Hickories	Northern Red Oak	Black, Pin and Scarlet Oak	White Oak	Chestnut Oak	Sugar (hard) Maple	Red (soft) Maple	Yellow and River (red) Birch	Beech	Ash, Basswood, Yellow-poplar 1/	Black Cherry	Elm	Gum	Paper Birch	All Species
Inches	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	
10	6,893	44	7,484	1,569															
12	7,989	86	10,105	1,520	833	2,429	7,364	4,718	3,519	600	2,549	2,164	913	3,105	600	334	807		
14	9,209	137	6,182	756	584	1,369	5,941	3,631	2,754	647	1,518	1,040	894	1,876	262		273	99	
16	3,625		5,773		151	1,316	2,990	3,743	1,019	796	1,517	398	458	1,670	277		262		
18	5,893		4,896	794	596	670	3,127	2,308	614	149	593		221	1,160	149		596		
20	1,512		3,015	266		902	471	1,804	1,350		263	527	588	618	193		294		
22	1,993		438			790		2,949	243	921				412			243		
24	3,814					498	296	3,176	365		296								
26			2,783					361	722	361									
28							435	1,512	435										
30	1,031							512											
Over 30			1,191						859										
All sizes	41,959	267	41,867	4,905	2,164	7,974	20,624	24,714	11,880	3,474	6,736	4,129	3,074	8,841	1,481	334	2,475	99	2/ 190,310

1/ Ash comprises roughly half of the combined volumes of ash, basswood, and yellowpoplar.

2/ Total includes negligible volume of little-used species.

stands the total volume of each species, and its distribution by tree diameter. Hemlock and white pine are by far the most abundant species, and reach large size. These two conifers together with small quantities of red spruce and pitch pine contribute nearly half of the board foot volume in the county's forests. Two-thirds of the hardwood volume is oak; the valuable white oak being the most abundant, particularly in the larger sizes. Red maple is next in abundance to the oaks, with ash, the birches, yellowpoplar, sugar maple, and beech following.

Intensive use keeps the forests depleted. The heavy demand for mine timbers puts tremendous pressure on the forests. Operators scour the county for timber large enough to make props. Clear-cutting is the standard practice regardless of age or size of trees. The county's forests are unable to supply more than one-third of the mine-timber requirement, and depletion of adjacent areas prevents the forest from having a breathing space in which to restore growing stock.

The seriousness of depletion is shown by relating the cut to the growth on well-stocked stands. The logs cut for lumber, ties, handles, and props, a total of 11,574 M board feet, (table 8), could be grown annually on 34,200 acres stocked as well as the best 4,200 acres of saw timber. The additional cut of small props, lagging, posts, and fuel, totaling 2,236 M cubic feet, could be grown annually on 27,500 acres stocked as the best 2,900 acres of cordwood stands with 18.8 cords per acre or more. That is, Luzerne County could support indefinitely a cut as heavy as that made in 1940 by using only 61,700 of her 365,000 acres of forest land provided she built up growing stock on these acres equal to that of her best saw-timber and cordwood stands of today.

Table 8 - CUT OF FOREST PRODUCTS, BY FOREST CONDITIONS
LUZERNE COUNTY, 1940

Products	Saw-timber condition		Cordwood condition		Both conditions	
	M bd.ft.	Additional M cu.ft.	M bd.ft.	Additional M cu.ft.	M bd.ft.	Additional M cu.ft.
Lumber	4,160		51		4,211	
Ties	1,952		204		2,156	
Handles	15				15	
Sprags				27		27
Props	4,266	870	926	1,029	5,192	1,899
Lagging 1/		(27)		(71)		(98)
Posts		17		4		21
Fuelwood		129		160		289
Total	10,393	1,016	1,181	1,220	11,574	2,236

1/ Lagging was principally obtained from the tops of trees cut for other purposes, or from trees too small to be tallied in the inventory. Hence its volume is not included in the totals.

THE FORESTS' CONTRIBUTION CAN BE INCREASED TENFOLD

Luzerne County needs everything her forests can give her -- wood, jobs, industries, forest recreation, watershed protection. Her present impoverished forests only begin to satisfy these needs. But if the quantity of merchantable saw timber per acre of productive forest could be raised from its present average of less than 600 board feet to only 2,300 board feet, the contribution of the forests to county welfare would be strikingly increased (table 9).

Table 9 - FOREST CONTRIBUTION TO LOCAL WELFARE
LUZERNE COUNTY, 1940

	Actual (1940)	Possible (1980)
Quantity of forest products		
Sawed	6,382,000 bd. ft.	45,000,000 bd. ft.
Round	122,500 tons	360,000 tons
Number of yearlong jobs	276	3,000
Value of forest products	$650,000	$7,500,000
Income to forest owners	$120,000	$520,000 - 675,000
Local taxes on timberland	$40,000	$ 80,000
Recreational values	Restricted	High
Watershed protection	Poor to good	Excellent

Nearly 45,000,000 board feet and 360,000 tons of round timbers could be grown and harvested yearly. This would provide employment to 3,000 men, greatly enlarge income to forest owners, and increase recreational and watershed protection values.

These seem like high goals to set. Yet they are by no means unattainable. Reasonably good forestry practice, beginning now, can considerably raise the productivity of the poor cordwood, young growth, and unproductive forest land. These now contribute nothing to the forest harvest, not because of poor soils, but because of overcutting and fires. Before accepting any lower level, Luzerne County would do well to consider the benefits to be attained by reaching the forest productivity goal set above.

The County now manufactures mostly low-grade forest products. Mine props may be crooked, knotty, and even slightly decayed, provided these defects do not seriously impair their strength. Rough lumber, most of which goes into the mines, may be knotty, narrow, and short. Yet many high-quality trees are now worked into props because their superior grade is not recognized in the woods, and many high-quality

logs are sawed into mine boards because the county lacks the furniture factories and other remanufacturing plants to absorb the better grades of rough lumber and hardwood dimension.

Present forests could support industries having high labor requirements. High-quality timber should be converted into high-grade products, and all qualities should, so far as possible, be converted into material adapted to remanufacture. It is remanufacture which chiefly multiplies jobs. Luzerne County now has not only the species but also the sizes of timber needed to support at least some such industries.

There is white pine for patterns, toys, and millwork. Northern red oak and white oak are available for furniture manufacture, and can also be made into excellent flooring. The poorer kinds of oak, such as black, pin, chestnut, and scarlet oaks, can be sawn into a medium grade of lumber for mine cars, and crates for war goods. Some of the sugar maple and yellow birch is suitable for spools, bobbins, toys, flooring, and furniture. The best beech can be utilized for flooring, furniture, and chairs, and for baskets which are sorely needed for handling farm products. Much more ash than at present could be used in the manufacture of handles. Basswood and yellowpoplar might go into furniture, and the black cherry, while not abundant, is suitable for gunstocks, furniture, and type backing.

Remanufacturing industries should not compete with mines for low-grade material. In promoting new wood-using industries, those should be avoided which would unduly compete with the mining industry for low-grade wood products, at least while mine requirements greatly outrun the Luzerne County supply. Industries such as pulp mills and hardwood distillation plants fall into this category. The industries mentioned in the preceding paragraph require high-quality raw material and need not compete with the mines for forest products.

The number of yearlong forest jobs can be increased over 10 times. Low-grade products require much less labor than remanufactured products. Studies made in Luzerne County indicate that saw timber can be logged, and rough lumber manufactured from it, with the expenditure of 11.5 days of labor per thousand cubic feet of wood, (table 10). Mine ties, sawed from trees somewhat smaller than the average sawlog tree, require more handling in the woods, and their manufacture absorbs 14.2 man-days of labor per thousand cubic feet of wood. Props and lagging are of such small average size that even though they require no manufacturing they use nearly as much labor as ties. Contrast with the labor requirements of these uses the more than 40 man-days needed to convert 1,000 cubic feet of wood into sprags or handles.

Study of employment in wood-using industries elsewhere in the northeastern United States bears out the local experience with remanufacture of wood. Furniture manufacture in adjacent counties of Pennsylvania and in Massachusetts employs one man about 125 days on 1,000 cubic feet of high-grade raw material. Novelties, turned wood, caskets, sash, doors, and general millwork, require about one-third less labor than

furniture, but patterns, toys, store fixtures, and wood-working require twice as much. The only plant remanufacturing high-grade wood in Luzerne County uses about one-third as much labor as would a furniture plant using the same quantity of raw material.

Table 10 - EMPLOYMENT PER UNIT OF WOOD, BY INDUSTRIES
LUZERNE COUNTY, 1940

Industry	Woods	Mill	Hauling	Total
	Man-days per 1000 board feet			
Sawmills	1.0	1.0	0.3	2.3
Tie 1/ mills	1.4	1.0	0.5	2.9
	Man-days per 1000 cubic feet			
Sawmills	5.0	4.9	1.6	11.5
Handle and sprag mills 2/	6.2	32.5	2.5	41.2
Tie mills	6.9	5.0	2.3	14.2
Props and lagging	10.1	0.0	3.7	13.8

1/ Mine ties
2/ Statistics for 1 handle plant and 3 sprag mills combined to avoid revealing confidential information.

In 1940 nearly 70,000 man-days of employment were required in Luzerne County's woods, sawmills, and her few remanufacturing plants, and in the transportation of raw material or finished products. An additional 23,000 man-days were based on wood grown outside the county, but remanufactured within it. If the amount of wood which may be harvested each year is raised to the goal set for 1980, and better use made of it, the number of jobs in forest industry can be increased more than ten-fold.

Wages in forest and wood-using industries should improve. Until recently, the wage level for woods and sawmill workers was low compared with that of other industries in the county. This is due in part to the intermittent character of much of this employment, and to the small size of operations. The wages of the forest industries have improved, however, and their total has become important in the economy of the back-country villages. During off-seasons some farmers work in the woods or sawmills, and farmers cut most of the fuelwood and posts. With the overall growth of forest industries, yearlong employment in them will become the rule rather than the exception, and both daily and yearly wages should steadily increase. Much of the labor required will be skilled.

The value of forest products can be increased more than eleven-fold. Sawmill and mine-timber operators who in 1940 handled about $615,000 worth of products would under the goal set receive about $2,850,000 a year, assuming no increase in the value per thousand board feet of rough lumber or per ton of mine props. If two-thirds of the rough

lumber were remanufactured in the county into furniture, toys, handles, and similar articles to which the native woods are adapted, the added value would be at least $4,000,000. More fence posts, and perhaps additional fuelwood, would bring the total value of forest products close to $7,500,000.

Income to forest owners can be increased from about $120,000 yearly to $520,000 or more. The greatly enlarged yield from the county's forests would account for this increase without any advance from the stumpage prices of 1940 for saw timber and mine timber. Increases almost certain to result from a higher average grade of sawlog, or in prices for mine timbers, bring the probable future return to perhaps $675,000. Because an overwhelming proportion of the best standing timber is locally owned, returns from the forest resource stay right at home.

The tax base can be widened in the very localities where it is narrowest. A four-fold increase in their growing stock, on the average, and an even greater increase in their stumpage returns, should allow forest owners to pay somewhat more in local taxes. It should be pointed out, however, that in 1940 taxes on their lands were about one-third of their total yearly income from stumpage (see table 9), and that tax delinquency continues. A doubling of future local taxes collected from forest land is perhaps a reasonable expectation. No attempt is made to predict the increased taxes that should be obtainable from new forest industrial plants. Although an $80,000 yearly revenue for local and county purposes will be, as $40,000 is now, a small part of the county-wide taxes on real property, in several rural townships the forest-land assessment is an important part of the tax base.

Large local populations will have greater opportunities for outdoor recreation, and rural communities can enlarge their recreation industry. Restoration of the forest where it is now poorest will benefit the entire population of the county. More than three-quarters of her citizens, living in towns and cities, today have not an acre of publicly-owned forest park in which to recreate body and spirit after the toil and danger of bread-winning. Their health and morale would steadily improve if the mine refuse banks, the strippings, and other drab and idle lands that surround their communities were beautified by trees. The Pocono Plateau has developed a promising recreation industry around remnants of forest and streams of rare beauty. These are separated by extensive areas of scrub oak, aspen, and fire cherry, periodically scorched by fire, and attractive only during the hunting season. Gradual restoration of these areas to commercial forest would yield attractive returns from varied recreational use.

Protection to watersheds against erosion and floods, and to mines against flooding, can be intensified. Restoration or improvement of forest cover would largely prevent the mud washes and boulder slides that recently played havoc with the county's railroads and would lessen at their source otherwise destructive floods in many mountain streams. Solomon Creek, which plagues the county seat, is typical of these streams. Its headwaters are on the slopes of Penobscot Mountain, which many decades ago was stripped of its timber and has been repeatedly burned; soil erosion has exposed the bed rock, over

which rain and melting snow run off unimpeded. Flash floods are common, and because the lower stream course is through heavily-populated sections, the damage is great. There is every reason to expect that by improving the vegetative cover on its upper watershed the flood danger from Solomon Creek could be materially reduced. This would make practical the development of much-needed public swimming pools and skating ponds.

By restoring a dense forest to coal company "surface" the seriousness of the mine-water hazard could be materially reduced. Flooding now threatens premature abandonment of mines in the Northern Coal Field. It is not the total amount of water to be pumped in a year that determines the capacity of the pumps which must be installed in a mine, it is the quantity that enters immediately following heavy rains or thawing of deep snows. Tree crowns intercept a part of every rain or snow and the forest carpet of fallen and decaying leaves takes up large quantities of water and slowly feeds it into the soil. It thus reduces surface runoff and delays underground flow into the mines. Where ditches and flumes must be constructed to keep water from entering the mines through open fissures and mine caves, a well-stocked forest is the best possible spreading ground for the diverted water.

A PROGRAM TO INCREASE FOREST BENEFITS

A timber stand from which 45,000,000 board feet of sawed material and 360,000 tons of round timber may be harvested yearly, and which will furnish adequate outdoor recreation and satisfactory watershed protection, cannot be built up overnight, or without vigorous action now. Such a goal (a higher one is not out of the question) can be attained in 40 to 50 years; how rapidly will depend squarely upon the interest which Luzerne County citizens take in it. A less ambitious goal, i.e., a smaller harvest in the same period, or the same harvest in a longer time, could be attained by action less drastic. Drastic action means, in addition to almost complete elimination of forest fires, putting a stop through public regulation to methods of cutting that keep the county's forests permanently depleted.

Forest growing stock must be restored. In 1940, Luzerne County cut nearly a million board feet more saw timber from her merchantable stands than they grew, but grew 3,400,000 cubic feet more cordwood than she cut. If this continues, her forests yearly become more and more mine-prop forests and consequently less and less able to support the industries that require saw timber of good quality. Saw-timber growing stock in merchantable stands is 190 million board feet. It needs to be more than 4 times this amount to support an annual cut of 45 million board feet. This can readily be built up during the next 40 years by shifting 5 million board feet of the mine-timber cut from trees that will make saw timber to trees of too poor quality to make sawlogs, but which are suitable for mine props. The cordwood growth is more than ample to cover this shift in cut. By depositing 5 million board feet annually in her forest savings bank where it will draw compound interest at a rate of 5.5 percent each year, the county will have accumulated more than 800 million board feet in forty years which will produce an annual interest of 45 million feet per year.

To attain this goal within the period set requires the adoption now of good forest practice on an intensive scale. Every year's delay will postpone attainment by just that much. For the forest types of the region, highest yields can be anticipated from adoption of selective cuttings repeated at frequent intervals. This makes possible the salvage of trees that otherwise would die and rot, the harvesting of small-sized material from tops and thinnings, and the constant improvement in the quality of remaining stands through removing crooked, diseased, injured, and limby trees. Selective cutting also will supply high-quality wood for special industries because even today some 82 million board feet is in trees 15 inches and larger in diameter. These should be harvested at maturity before decline in vigor and entrance of decay reduces their value. It is expected that most of the proposed saw timber cut of 6,715,000 board feet can be harvested from trees of such size.

Protection of all lands against fires, insects, and disease must be improved. An average of 4,246 acres burned over yearly in Luzerne County from 1936 to 1941, in a total of nearly 3,000 separate fires. Reduction in the number and area of these fires is essential to the rehabilitation of the 60,000 acres of scrub oak land in which most, but by no means all, occurred.

The already intensive measures against fire now being employed by the State might be supplemented by the following: (1) Safety strips, maintained along all railroad trackage through forest land, to reduce the inflammable material which sparks from locomotives often ignite; (2) certain physical improvements needed to permit fire fighters to reach forest fires more promptly in many areas now inaccessible (see Anthracite Survey Paper No. 2); (3) changes in the local administration of the fire laws which will prevent forest fires from becoming a tempting source of income to registered State fire crews and volunteer municipal fire departments; and (4) greatly increased public education, including demonstration planting of forests, to awaken an intense desire among local people to keep the forests green.

Although native insects and diseases are only locally destructive in the Anthracite Region, imported enemies may devastate the forest; the havoc wrought by the oriental chestnut blight in Luzerne County forests is still vivid in many minds. The European gypsy moth, the caterpillar of which strips the leaves from a wide variety of trees, including evergreens, has recently invaded the county. So has the Dutch elm disease. State and Federal agencies are cooperating in intensive efforts to exterminate these pests; at the very least, control measures should be continued to make certain that they do not spread.

Planting is necessary to increase the value of the 60,000 acres of scrub oak and other waste land. In its present condition, its only value is in the production of wild game. Game experts, however, feel that a small, well-distributed fraction of these thousands of acres is all that is necessary to sustain a desirable game population. Conversion of scrub oak to mixed stands of good species would facilitate protection against fires, insects, and disease. Large, unbroken

areas of scrub oak constitute a serious menace to adjacent productive areas because they are feeding grounds for insects, and places where fires start readily and spread rapidly. Nearly 40,000 acres is practically pure scrub oak, with a sprinkling of more valuable oaks and pitch pine. Their forest composition is an invitation to insects such as the gypsy moth, which may here become epidemic.

Planting of these waste lands offers a reservoir of public work, should such work again be necessary in periods of slack employment. Planting here and there in the 187,000 acres of young timber will hasten the time when it also will attain full productivity.

LOCAL ACTION THE KEY TO SUCCESS

The action necessary to increase substantially the forest's contribution to county welfare has been described. For the most part it is local action. The State and Federal governments cooperate in several fields, among them protection against fire, insects, and disease; multiplication of game and wildlife; and fact-finding, such as the present survey. Continuance of this cooperation, and especially its expansion, also depend on local interest.

To be effective, this interest must come from

1. Forest landowners
2. Sawmill men and timber operators
3. County officials
4. Township and municipality administrators
5. Coal and water company executives
6. Members of civic organizations
7. The citizens and taxpayers

Each of these has a special part to play:

The forest landowner can control cutting. Because his timber may not be cut without his consent, the landowner has it in his power -- and it is to his own great advantage -- to stop overnight the clear-cutting of large areas and the cutting of immature trees which keep the forest resources of the county at a low ebb. The market for forest products in Luzerne County is a seller's market. Local requirements offer the forest owner an opportunity to obtain a regular and substantial income from his property. The war has improved this opportunity.

The common practice in Luzerne County at present is to sell timber by the tract, for a lump sum. This nearly always leads to heavy or clear-cutting. To safeguard their interests when offering a lump sum for standing timber, most timber operators make liberal allowances for errors in estimates, hidden defects in the timber, and fluctuations in the lumber market. Once in possession of cutting rights, operators naturally cut even the smallest trees that seem likely to pay expenses, and they have little incentive to avoid injuring those they do not cut. The landowner, however, needs to sell only the larger trees in his woods,

or small, low-quality trees, reserving a thrifty stand. This may be accomplished by blazing or otherwise marking the trees to be cut. Payments before the cut material is removed from the woods are likely to be higher to the landowner and fairer to both buyer and seller if based on actual scale in board feet of sawlogs, linear feet and average diameter of mine props, or stacked cords of wood.

The advantage of all concerned -- immediately to the landowner, and in the long run to timber operators and the public -- in selling only marked trees and by scale, is illustrated by the experience of the owner of a 30-acre tract of thrifty, young timber. He was offered $500 for the right to cut it clear. Had he accepted this offer, he could hardly have grown an equal crop of timber in his lifetime. The Industrial Forestry Department of the Wyoming Valley Chamber of Commerce examined the stand and marked trees for cutting. The owner has received $375 for less than one-fourth of the volume. The stimulated growth of high-quality trees reserved from immediate cutting will yield about the same amount every 8 to 10 years hereafter. With similar good management and marketing, the forest owners of the county could maintain their current forest income while improving the quality of their growing stock.

Competent selection of the trees to be cut, arranging and supervising the sales of stumpage, and scaling the cut material, requires the help of foresters. If this help is not available from Federal, State, or County governments, or from such a semi-public agency as the Wyoming Valley Chamber of Commerce, it might be obtained at reasonable cost to the small owner through a timber owners' association. A cooperative organization of this type might also make loans on standing timber or obtain Federal or State legislation creating the necessary credit institutions. The bargaining and marketing power of such associations should largely offset the costs of their services. A farm forester has recently been assigned the task of building up a forest products marketing service in Luzerne, Lackawanna, and Wyoming Counties. This service under the joint sponsorship of the Pennsylvania Department of Forests and Waters, the Wyoming Valley Chamber of Commerce, and the Forest Service should be of considerable aid to the County's forestry program.

Sawmill men and timber operators in the business to stay can serve their own interests by cooperating. Reducing the amount of saw timber cut for mine timbers in Luzerne County would compel some operators to look elsewhere for their larger timber. This might work some hardship. But it would favor reliable operators who expect to make timber harvesting their career, and therefore cut with an eye to the future.

Temporary restriction of saw timber cut to build up growing stock would insure ample timber for the future, and the better quality of wood handled would serve to maintain the total value of products. If industry were to remanufacture in furniture factories or similar wood-using industries only about 3.4 million board feet annually, the present level of forest employment in the county could be maintained.

The county should have authority to restrict cutting on private land. So much of public value is at stake in rebuilding the forests of Luzerne County that the private forest owner can no longer be considered to have the right to manage his property exclusively in his own immediate interest. "Skinning" the forest often leads to tax delinquency; it robs workers of jobs; it defaces wooded localities so as to destroy their attractiveness to recreation seekers; and it may aggravate the irregularity of streamflow or complicate the problem of mine-water control. The County Zoning Act of 1937 was aimed to restrain such private action at odds with the public good. The State Planning Board interprets this Act as permitting a county, where public opinion is plainly favorable, to bar further agricultural settlement from zones of poor soil. It may be possible to invoke the same Act to prevent clear-cutting in forest zones. At present neither the State of Pennsylvania nor the Federal Government has the authority to regulate the cutting of timber on private land.

The county can create county forests from tax-delinquent lands. The creation of county forests under the County Forest Act of 1933 should result in effective use of forest and other "wild" land already delinquent (see Anthracite Survey Paper No. 3). The Industrial Forestry Department of the Wyoming Valley Chamber of Commerce recently classified tax-delinquent forest lands for the Luzerne County Commissioners. It recommended that 2,821 acres be declared county forests, and that 1,611 acres be sold to the State Game Commission for additions to adjacent Wildlife Areas. On its recommendation 762 acres of better land was sold or will be sold "to reputable owners" as "forest farms." Some 1,200 acres is held for further examination.

Public ownership of forest land is particularly desirable in recreational developments where water is a chief attraction. Under private enterprise the drainage from hundreds of acres has been impounded in reservoirs or lakes, and a few score acres of each resulting shoreline have been highly developed for camp sites or seasonal residence. The "hinterland" usually remains almost valueless. If the county or other public agency created a reservoir on tax-delinquent lands, it might extend camping, bathing, boating, and skating privileges to the general public, this making effective use of their recreational possibilities.

The townships and municipalities can strengthen fire protection and administer local public forests. A joint investigation of the forest fire situation in Wilkes-Barre and adjoining townships, by the State Firewarden and the Wyoming Valley Chamber of Commerce, has recently shown the advantages of constructive township action. Should a future unemployment relief program be necessary, the municipalities could supervise and sponsor works on nearby county forests. These might include the construction of fire breaks, truck trails, and water facilities for fighting fires; the improvement of timber stands; and the development of recreational facilities and watershed protection.

Corporate landowners can profitably set an example of forest management. Some have. The largest water company in Luzerne County owns a considerable acreage of land surrounding its numerous reservoirs. This

was for years the outstanding example in responsible forest-land ownership in the county. More recently, a coal company located in an area of great public irresponsibility won effective community support for a constructive program of forestry on company land.

By encouraging school children, the local fire companies, service clubs, sportsmen's organizations, women's clubs, and others to plant trees or shrubs on mine refuse banks, strippings, and open areas bordering towns, coal companies can educate the public to the value of green forests. Such a program would reduce the number of forest fires and at the same time beautify the communities, minimize the blowing of coal dust and ashes -- a source of much annoyance -- and prevent severe erosion which now blackens and clogs the streams.

Company plantations, thinning of young timber, selective cutting of mature timber, and participation in protection against forest fires, should be considered on their merits as both educational and business measures. The coal companies have the land. Many of them are long-lived, and can afford to plan for decades rather than years ahead. They provide their own market for all the wood they can raise. Particularly those that own timber now merchantable might set an example of forestry which the citizens of the county could understand, and which other landowners would follow.

Civic organizations can promote new and permanent wood-using industries. New industries can best be attracted to Luzerne County by chambers of commerce, boards of trade, and similar organizations familiar with the problems of industry. Promotion of such enterprises must of course rest squarely on the facts as to existing and prospective wood supplies. It should not be undertaken without consideration of their effect on the anthracite industry's supply of mine boards and larger mine timbers. For these reasons special consideration should be given to industries requiring relatively large amounts of labor and using small quantities of special wood products.

The citizens and taxpayers can insure success of the forestry program. Every citizen of the county can help mould public opinion toward supporting a forest restoration program. It will take strong community feeling and aggressive action to awaken many owners of forest land and temporary owners of timber -- the sawmill operators or timber contractors -- to a realization that too heavy a present harvest of wood imperils the future community. Individuals die, but the community lives. The community has every moral right to protect its future.

Citizen pressure on members of the legislature will be necessary to obtain legislation restricting the cutting of private timber in order to perpetuate the supply. Citizen support of progressive steps already taken to create county forests from tax-delinquent land is equally necessary. Under representative government county and local officers cannot move far ahead of public opinion.

Individual effort is excellent. Organized effort is often better. The value of organization to promote forestry is illustrated by the

Wyoming Valley Chamber of Commerce. First its committees, later the whole organization, asked for the State and Federal help which resulted, respectively, in intensified forest fire protection in the Valley, and a regional study of forest resources and employment, of which the present paper on Luzerne County is a progress report. Through its industrial forestry department, the Chamber vigorously follows up both of these enterprises. In addition, it is aiding the forest landowner directly, is cooperating in the county forestry program, is helping the railroads develop a program for stabilizing landslides in the Lehigh River Valley, and is sponsoring several tree-planting projects.

Above all else, vision is necessary. Chambers of commerce are only one type of organization to which enthusiastic but informed members may present a vision -- the forests of the future. To such organizations the future forests will appear as the source of busy industry. To women's clubs and service organizations -- the only public forest recreational area in the county is a fruit of one club's efforts -- they will appear as a means to health and beauty in the community. To granges, they will be an additional farm crop of many virtues. To labor unions, they will offer opportunities for yearlong, permanent jobs at reasonable wages. These are visions worth every citizen's effort to convert into reality.

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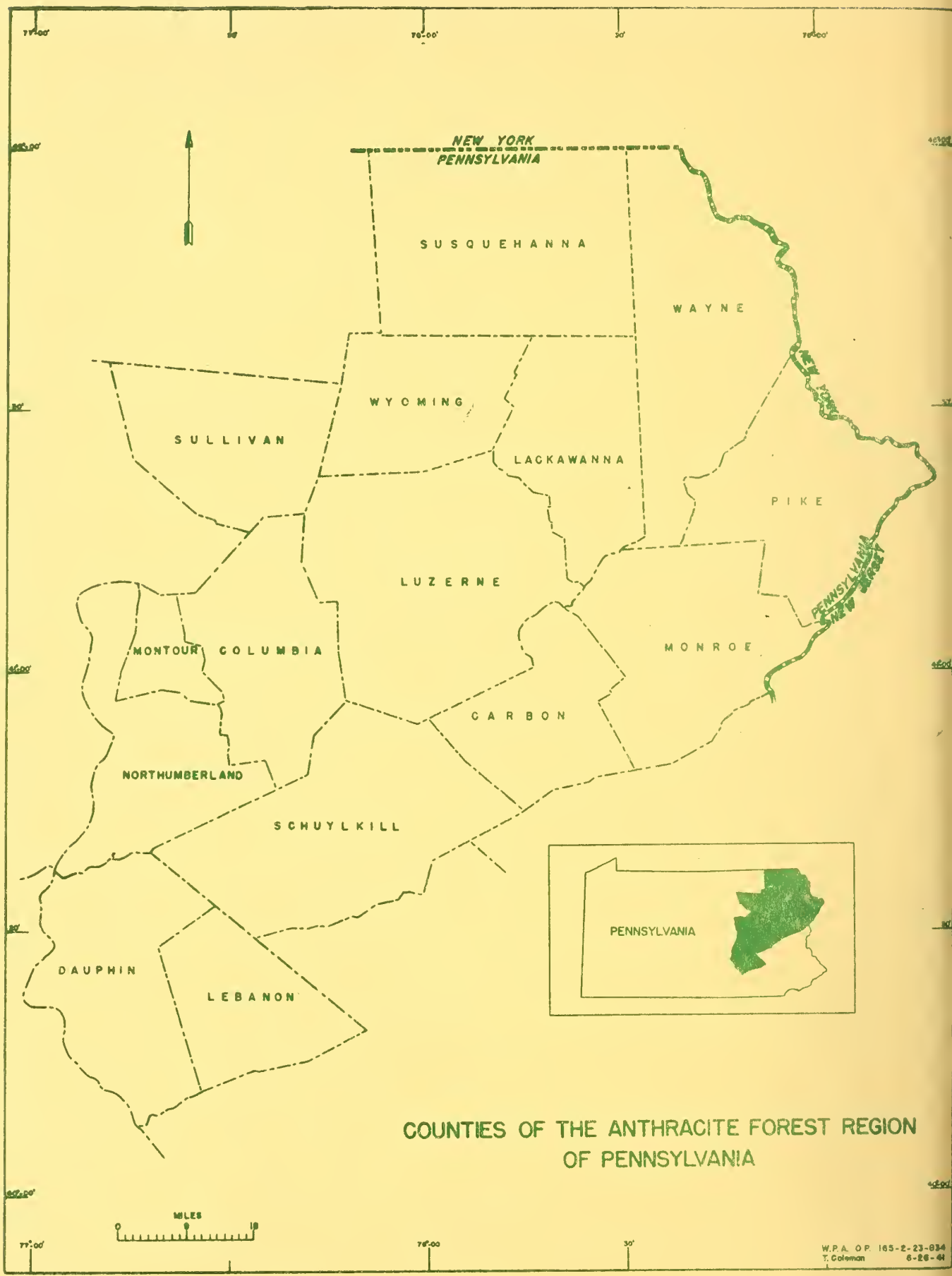

COUNTIES OF THE ANTHRACITE FOREST REGION
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